

NON-PUBLIC?: N
ACCESSION #: 8909180326
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Salem Generating Station, Unit 2 PAGE: 1 OF 05

DOCKET NUMBER: 05000311

TITLE: Rx. Trip; Loss of 5 of 6 Circ. Water Pumps Due To External Causes
EVENT DATE: 06/10/89 LER #: 89-013-01 REPORT DATE: 09/06/89

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: M.J. Pollack - LER Coordinator TELEPHONE: (609)339-4022

COMPONENT FAILURE DESCRIPTION:
CAUSE: B SYSTEM: NN COMPONENT: RLY MANUFACTURER: S440
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: N

ABSTRACT:

On 6/10/89, a reactor trip was manually initiated from 15% reactor power due to the loss of the main condenser on high back pressure. At 2306 hours the "Screenwash Trouble" overhead annunciator in the Control Room alarmed due to high diff. level (dl) across several Circulating Water System (CWS) screens. A power runback was initiated. Within five minutes of the alarm, five of the six circulating pumps tripped on high dl across their associated screens. The Turbine was manually tripped with the reactor at 48% power. Subsequently, the functional turbine bypass valves (steam dumps) were armed and opened. Condenser back pressure increased to where the permissive to use the steam dumps was exceeded. The steam dump valves closed and the first main steam safety valve in each steamline lifted. Direction was given to manually trip the reactor. The root cause of this event has been attributed to external causes and inadequate corrective action from a similar prior event. Large accumulations of grass and debris on the screens caused the high dl. On 8/11/83, a similar event occurred. The corrective action from the prior event did not require any long term actions. A review of the

preventive maintenance (PM) history for cleaning the trash racks was conducted. It was found that no specific PM requirement existed. The racks were last cleaned three years ago. Therefore, a PM task to require special cleaning of the trash racks every refueling outage has been established. The trash racks were cleaned of the grasses and debris and the Unit was returned to power on 6/14/89. The failed 21A Circulating Water Pump Struthers Dunn relay which prevented it from tripping was replaced.

END OF ABSTRACT

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PLANT AND SYSTEM IDENTIFICATION:

Westinghouse - Pressurized Water Reactor

Energy Industry Identification System (EIIS) codes are identified in the text as xx

IDENTIFICATION OF OCCURRENCE:

Manual Reactor Trip From 15% Power; Loss of 5 of 6 Circulating Water System Circulator Pumps Due To External Causes and Inadequate Corrective Action From A Similar Prior Event

Event Date: 6/10/89

Report Date: 9/06/89

This report was initiated by Incident Report No. 89-348.

CONDITIONS PRIOR TO OCCURRENCE:

Mode 1 Reactor Power 100% - Unit Load 1140 MWe

DESCRIPTION OF OCCURRENCE:

On June 10, 1989 at 2319 hours, a reactor trip was manually initiated from 15% reactor power due to the loss of the main condenser on high back pressure. This blocked automatic operation of the turbine bypass valves (steam dumps). Five of the six circulating pumps had become unavailable due to excessive differential level across the travelling water screens.

On June 10 at 2306 hours, prior to tripping the plant, the

"Screenwash Trouble" overhead annunciator in the Control Room alarmed. Investigation revealed high differential level (dl) across several Circulating Water System (CWS) INN) screens. A power runback was initiated. Within five (5) minutes of the screenwash trouble annunciation, five of the six circulating pumps tripped on high dl across their associated screens. At 2311 hours, the Turbine was manually tripped with the reactor at 48% power (permissive P-9 is set at 50% power). Subsequently, the functional steam dumps were armed and opened. Only the 21 shell side steam dumps were functional since 21A Circulating Pump was the only pump operating. Condenser back pressure increased to the point where the permissive (20 inches of Hg) to use the steam dumps was exceeded. Subsequently, the steam dump valves closed and the first main steam safety valve in each main steamline lifted. Direction was then given to manually trip the reactor. The plant was stabilized in Mode 3 (Hot Standby).

The Nuclear Regulatory Commission was notified of the actuation of the Reactor Protection System in accordance with Code of Federal Regulations 10CFR 50.72 (B) (2) (ii)

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APPARENT CAUSE OF OCCURRENCE:

The root cause of this event has been attributed to external causes and inadequate corrective action from a similar prior event.

The CWS screen high differential pressure was the result of large accumulations of grass and debris on the screens. The day before this event, extreme weather conditions were prevalent. This included very heavy rainfall and winds. This weather caused significantly greater amounts of grass and debris to be present in the river.

The trash racks are cleaned by a heavy duty, traversing type trash rake. The rake is not able to clear the racks when the trash racks become matted with excessive amounts of grass and debris. Due to this clogging of the trash racks (lower third), higher than normal surface water velocity caused increased accumulation of grass and debris on the screens.

On August 11, 1983, a similar event occurred (reference LER 272/83-033/01T). The corrective action associated with the prior event did not require any long term actions. The actions completed involved the immediate cleaning of the trash racks and the return to

power of the Unit.

ANALYSIS OF OCCURRENCE:

The CWS is the plant cooling system designed to dissipate waste heat to the Delaware River. The system takes suction from the river through a fixed trash rack and vertical traveling screens with fish troughs. The water is pumped, via vertical circulating pumps, into the Unit's triple shell divided water circuit single pass surface condenser.

During low tide, a waterfall effect can be observed of incoming water rising over the trash racks if they are matted with grass and debris. This waterfall effect was observed by the system engineer on May 25, 1989. On May 25, the System Engineer submitted a Recurring Task requiring special cleaning of the trash racks each refueling outage using divers and hydrolazing techniques, as applicable.

Approximately thirty (30) minutes prior to the reactor trip, the trash rake failed. This rake is used to remove grass and debris collected on the trash rack. The trash rake open/close cables had frayed and broken. Engineering determined that the excessive amount of grass and debris caught in the rack caused the rake to ride out of the rack bars causing the vertical guide wheels to come out of their track. This caused enough stress to fray and break the lift cables when the rake approached the top of its travel path. This failure did not contribute to the event since it occurred during the cleaning of the last of the six Unit 2 trash racks. The trash racks were already clogged with debris causing the "waterfall effect" which brought significant amounts of debris through the upper part of the trash rack and onto the traveling screens.

Investigation of this event revealed that 21A Circulating Water Pump

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ANALYSIS OF OCCURRENCE: (cont'd)

which had not tripped, should have tripped. The trip setpoint for the pump is a differential level (dl) of 10 feet. The indicated dl, in the Control Room, was 13 feet. Investigation revealed that the transmitter signal could not be received due to an open coil on a Struthers Dunn relay (manufacturer's number 236ABXP). Had the relay functioned properly, the pump would have tripped resulting in the loss of the steam dump capability sooner. Subsequently, the reactor

would have been taken off line from a higher power level.

During this event the MS10 valves (atmospheric reliefs) did not open automatically when the steam dump system became non-functional. This resulted in the lifting of the first safety valve in each main steamline. The MS10 valves were opened manually during this event. All other systems functioned as designed during this event.

Engineering investigation of the MS10 concern indicates that the control circuit design is inadequate. The circuit is designed to control steam pressure. This is done by comparing a pressure setpoint to actual steam pressure. The pressure setpoint is typically 1035 psig during normal power operation and is adjustable from the operators console. Since steam pressure at 100% power is approximately 800 psig the controllers are continually attempting to close the MS10 valves in order to increase steam pressure. The controllers perform an integral function on the error (difference between setpoint and actual pressure) and continue to hold the MS10s closed. Although the controller output cannot decrease below 1 volt (valves fully closed), the internal electronics will continue to integrate the error and will eventually saturate to a very low value. When a signal arrives at the controller, indicating that pressure is above the setpoint, the controller electronics require minutes to unsaturate and provide an open signal to the MS10s. This response is so slow, during system transients, that the safety valves open before the MS10s. It is not certain under what transient conditions the MS10s would prevent the safety valves from opening if not for this control problem. It is certain, however, that they would greatly assist recovery.

All safety valves which lifted did so at their design setpoint.

This event did not affect the health or safety of the public. However, due to the manual actuation of the Reactor Protection System, this event is reportable in accordance with Code of Federal Regulations 10CFR 50.73 (a) (2) (iv).

CORRECTIVE ACTION:

A review of the preventive maintenance history for cleaning the trash racks was conducted. As indicated in the Analysis of Occurrence section, it was found that no specific preventive maintenance requirement exists; however, they were last cleaned three years ago. Therefore, a preventive maintenance activity has been established to clean the trash racks every refueling outage (18 months).

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CORRECTIVE ACTION: (cont'd)

The trash racks were cleaned of the grasses and debris using divers and hydrolazing. Subsequently, the Unit was returned to power on June 14, 1989.

The failed 21A Circulating Water Pump Struthers Dunn relay was replaced. Proper operation of the transmitter and relay was verified and returned to service.

The trash rake was repaired. The trash rake will be modified to improve reliability and performance by December 1991.

The MS10 controls will be upgraded. This will be done as part of an overall control system upgrade in order to ensure compatibility and consistency with other planned system upgrades. The Unit 1 and Unit 2 upgrades are presently planned to be completed during their 10th and 6th refueling outages, respectively.

General Manager -
Salem Operations

MJP:pc

SORC Mtg. 89-091

ATTACHMENT 1 TO 8909180326 PAGE 1 OF 1

Public Service Electric and Gas Company P.O. Box E Hancocks Bridge,
New Jersey 08038

Salem Generating Station

September 6, 1989

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Dear Sir:

SALEM GENERATING STATION

LICENSE NO. DPR-75

DOCKET NO. 50-311

UNIT NO. 2

LICENSEE EVENT REPORT 89-013-01; SUPPLEMENT

This Supplemental Licensee Event Report is being submitted pursuant to the requirements of 10CFR 50.73. A discussion of the failure of a component to function as designed has been added. Additionally, the Description of Occurrence section has been editorialized and the Corrective Action section has been updated to reflect completed actions and new actions.

Sincerely yours,

L.K. Miller
General Manager -
Salem Operations

MJP:pc

Distribution

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